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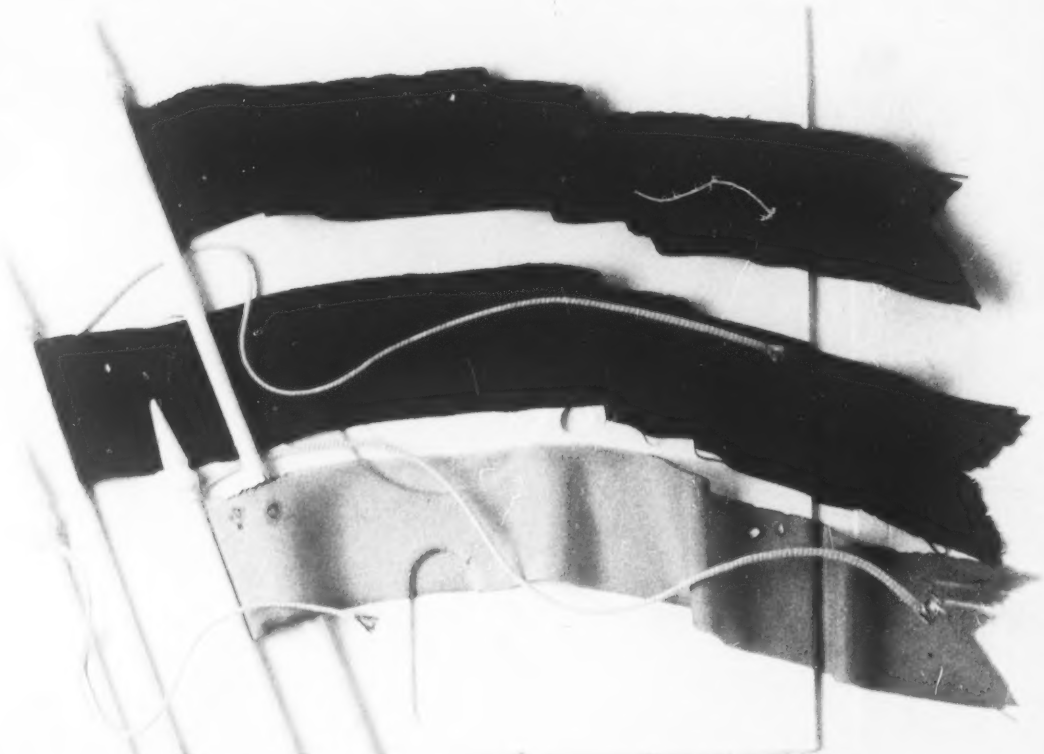
SPECIAL REPORT: Client/Server: The Model for the '90s

DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE SOFTWARE REVOLUTION

How IS Executives Are Changing The World of Software Development



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Maintaining the Competitive Edge

The IS Engine Driving Infiniti

The World Bank's Open Network

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

FEBRUARY 15
1990

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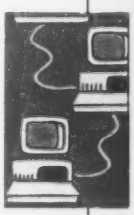

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Change for the Sake of Productivity

Revolutions come in all stripes—political, social, industrial, scientific, etc. All except a few revolutions, such as those events unfolding in Eastern Europe, are visible only in hindsight. When we're caught up in a revolution or on the sidelines of one, we hardly know it until a *Newsweek*, *Fortune* or other popular media outlet tells us so, usually well after the fact.

The ability to see economic and technological revolutions as they are happening is an important quality in any manager. The intelligence to decide whether his or her organization should participate in them and the will to do so are even stronger assets. For example, those executives and organizations who foresaw the revolution in financial services that occurred in the past decade were, for the most part, aptly rewarded.

In the IS sphere, the rewards seem bountiful for those managers who recognize that there are, indeed, fundamental changes taking place in the creation and maintenance of applications—the very heart of so many of today's information technology-intensive organizations. In our cover story, "The Software Revolution," senior writer Jeff Moad examines the scope of the movement to transform the design and support of software applications from a craft to a discipline. It's one that may transform organizations that embrace such discipline into much more productive enterprises in nearly every facet of their operations.

Photograph by David Bradley

MOAD: Examining the software design discipline.

Moad's exhaustive research, involving scores of interviews with *Fortune* 1,000 companies and with software suppliers, took him far deeper into the subject than any DATAMATION editor had comprehensively probed before. He talked to chief information officers who are hounded by their companies' chairmen to improve software productivity as well as to the individuals charged with seeing that sought-after productivity gains are realized. The titles of users who appear in the cover story—like data analyst, director of data resource management, corporate software manager and data center director—evince the depth of Moad's reporting.

As revolutionary as is his subject matter, Moad's conclusion is probably one that has been repeated time and again—in different centuries and in different businesses: the tools are at hand, but the will to use them is lacking. Moad finds that although products and techniques like as computer-aided software engineering are advancing fast enough to enable a true revolution in software development, what's in short supply at all but the exceptional user organizations is the management foresight and IS culture to bring about such change. "For most companies," he writes, "reality is lots of installed applications, an entrenched way of developing new software and management that may not be willing to pay the price of upheaval and uncertainty in order to get a new automated software development process."

For the sake of more productive enterprises, users should be willing to pay such a price. The cost of avoiding the revolution will certainly be much higher.

A Model for Systems & Strategies

Joining Moad on the trail of revolutionaries in this issue is Dallas bureau manager Bob Francis. In the third installment of our Systems & Strategies series, Francis studies what's behind the hottest buzzword of the new decade—client/server systems. In "Client/Server: The Model for the '90s," Francis positions PCs, workstations, local area networks and servers for users who seek to take advantage of such distributed computing power.

Tim Mead

Tim Mead, Editor in Chief

DATAMATION

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Maintaining the Competitive Edge

Why are IS managers paying maintenance new respect? They're spending as much as 80% of software resources on keeping existing programs intact, and they're determined to see maintenance as a strategic tool.

BY JEFF MOAD

Traditionally, management at most companies has thought very little about the people who keep the software working. CEOs, CIOs and the like have been far more interested in the whiz-kid programmers who were developing the applications of tomorrow.

Lately, however, companies are finding themselves up to their elbows in unpleasant software maintenance consequences. The chore of fixing and upgrading aging applications software programs—which have grown to millions of lines of code in some cases—now eats up the lion's share of total software resources at most corporations. In fact, in some organizations, the maintenance burden has grown so large so fast that there is little if any money left over to develop new applications.

"We're doing virtually no new development anymore," says Gail Morden, systems program manager for the Federal Home Loan Bank in San Francisco. As the agency that regulates the besieged thrift industry nationwide, the bank has seen requirements for its existing applications change radically in the last year. "As a result, all we're doing is maintaining and enhancing applications and buying some off-the-shelf software as we need it. We've turned into a maintenance shop," Morden says.

Most companies spend 60 to 80% of their software budgets on maintaining existing applications, according to industry experts, whose definition of maintenance includes updating as well as fixing bugs in existing applications. Stamford, Conn.-based Gartner Group Inc. estimates that U.S. corporations spend $30 billion annually on software maintenance. The market research firm further calculates that fixing and reengineering existing applications will consume 90% of IS software resources by 1995.

With such high stakes, it's no wonder that companies are taking a hard look at their software maintenance operations. Large companies in information-intensive industries such as insurance, banking and telecommunications are intent on cutting maintenance bills. But they're also determined to regard maintenance in the same way they treat software development—as a tool for gaining a competitive edge.

Achieving such status means that companies must change the image of software maintenance as a dead-end activity performed only by programming rookies and development washouts. To do so, many are attempting to:

- Lure some of their best programmers into maintenance by providing improved working conditions, attractive career paths and even pay bonuses,
- Refine their software maintenance organizations, and
- Develop computer-aided software engineering (CASE) platforms that incorporate maintenance tools and software reengineering techniques.

At some companies, the push to improve software maintenance has led to a full-fledged "be kind to maintenance programmers" movement. At the re-

ROYAL BANK'S DIXON: Management at Canada's largest bank redefined maintenance to include only correcting errors and making minor enhancements costing less than $50,000.

Photograph by Ottmar Bierwagen/Black Star

Maintaining a Competitive Stance

Here's what three leading users have and what they're doing to make sure they're ahead of the pack on managing software maintenance.

U.S. WEST

- Conducts management road shows for programmers;
- Gives awards, including bonuses, to outstanding maintenance staff;
- Seeks input from programmers on how to improve workplace conditions;
- Split maintenance from development.

ROYAL BANK OF CANADA

- Redefined maintenance to include only correcting errors and making minor enhancements (less than $50,000);
- Reclassified major applications enhancement as development;
- Subjects the function to more rigorous cost-benefit analysis;
- Measures the effectiveness of maintenance, based largely on numbers of errors and system uptime;
- Pays programmers bonuses of up to $3,000 per year for meeting given performance levels.

MASS MUTUAL

- Requires programmers with management ambitions to spend some time in its maintenance organization;
- Has shortened the time it takes for maintenance programmers to advance to business analyst positions from seven years to three years;
- Conducts self-critiques and sends them to end users;
- Reports on planned changes to end users.

gional Bell operating company U.S. West Inc., for example, IS managers and consultants recently met with 1,000 to 1,200 maintenance programmers located across the western United States. During the three-day road show, managers gave awards to outstanding maintenance programmers and collected suggestions that would help the programmers be more productive. Among other things, the programmers said they wanted flexible work hours and easier transfers between groups. Management of the Englewood, Colo., company promised to deliver.

U.S. West has also begun awarding maintenance programmers spot bonuses as recognition for outstanding performance—not to mention motivation. And the company has made organizational changes, splitting maintenance away from development. The move allows the company to focus on maintenance and to keep the growing maintenance activity from overwhelming development, which now accounts for only about 15% of U.S. West's software spending. "It's difficult to worry about tomorrow when you're drowning today," says Jim Shelton, U.S. West's director of systems development and maintenance, in explaining why the company devotes so much of its resources to maintenance.

This new focus on software maintenance is something long past due. For years, say maintenance professionals, IS management has showered new applications development with lots of attention

☐ INFORMATION-INTENSIVE INDUSTRIES ARE INTENT ON CUTTING MAINTENANCE BILLS.

and the latest in new tools, while viewing maintenance as a necessary, though not particularly critical, function. Management was often slow to invest in advanced maintenance tools such as test coverage analyzers and source-level debuggers. For programmers, a maintenance assignment has often been viewed as a path to nowhere. "It was a dead stop," says Judith Marx Golub, president of the Staten Island, N.Y.-based Software Maintenance Association. "Management always looked to the development people and made them managers, not the maintenance people."

Experts also blame academia for the second-class status to which maintenance has been relegated. Robert Glass, editor of "Computing Trends" of State College, Pa., says, "Most universities are doing almost nothing to prepare programmers to do maintenance. Academics think you can learn enough about maintenance by learning development, but it's just not true."

Ironically, says Glass, IS managers' infatuation with software development had led them to assume all was well on the maintenance front. That assumption has been challenged as the maintenance function at many companies gobbles up more and more resources—in some cases limiting new development efforts. "As they see less and less development going on, management is trying to understand what these [maintenance] people are doing. They're finally taking an interest," says SMA's Golub.

Controlling Maintenance Costs

IS executives at The Royal Bank of Canada are certainly keeping an eye on maintenance dollars these days. Keeping the Toronto-based bank's massive, aging systems working and up to date has taken a larger and larger maintenance staff over the years. "About two years ago, management looked at the growing amount of resources that were being chewed up by maintenance," says retail banking systems manager Doug Dixon. "They concluded that people were being added, but they weren't sure what return they were getting."

They soon found out and, as a result, redefined maintenance at the bank, Canada's largest. Like many companies, the Royal Bank discovered that the fastest growing and most critical piece of its maintenance effort was not tied to what most people think of as software maintenance: fixing problems in existing programs. Rather, it was spending lots of maintenance dollars to add significant new functionality to existing applications.

"We wanted to make sure the rest of the bank understood that what we were doing was really creating new function and new value, not just fixing bugs," says Dixon. So IS management redefined maintenance to include only correcting errors and making minor enhancements, typically costing less than $50,000. The rest of the function—making major enhancements to applications—was reclassified as development and subjected to the same rigorous cost-benefit analysis and service-level agreement process as a new application development project. Such scrutiny helps account for and justify some of the larger expenditures that had previously been loosely lumped under maintenance.

To keep maintenance programmers happy and encourage good development

programmers to consider maintenance, companies are also trying to develop clear career paths that include maintenance. Boston-based Massachusetts Mutual Life Insurance Co., for example, now requires programmers with management ambitions to spend some time in maintenance. The company has also created an analyst development program as a way for maintenance programmers to move into consultant-like business analyst jobs in three years. In the past, it has taken approximately seven years for maintenance programmers to move up.

Setting A Career Path

"Management here is particularly sensitive to the fact that product support is the lifeblood of our business," says Jeff McEwen, Mass Mutual's director of system resource development. "To a large extent, our products revolve around information, and we have to support it with professional software maintenance."

Mass Mutual also seeks to build stronger bonds and better communication between software development and maintenance organizations. Each year, the company's maintenance team evaluates its performance and reports on planned changes—and it sends the reports to its clients.

In the long run, says McEwen, technology may further blur or even erase the line between development and maintenance. To the extent that CASE technology allows programmers to work exclusively at the requirements and specification level, there will eventually be little difference between maintenance and development.

> ☐ I HAVE WANTED TO BELIEVE IN REVERSE ENGINEERING, BUT I JUST DON'T.

"In the future, we think the roles of maintenance and development will merge," says McEwen. "With new tools like code generators, everyone will be going back to the specification level to make new applications or changes anyway."

Toward that end, Mass Mutual and many other companies are currently mapping out advanced CASE development environment strategies, aimed at enabling them to manage the full life cycle of their applications. Mass Mutual calls its approach the Existing Application System Environment. So far, the company has settled on Texas Instruments Inc.'s Information Engineering Facility (IEF) CASE product for overall life cycle management. The company is currently evaluating maintenance tools that can fit into the IEF framework.

IN THE LONG RUN AT MASS MUTUAL, technology will further blur the line between development and maintenance.

As they attempt to build on CASE to solve their maintenance problems, companies like Mass Mutual are discovering a harsh reality. To date, CASE vendors have largely been unable to satisfy maintenance programmers' greatest need: products that can be used to reverse engineer existing applications to take advantage of advanced CASE design, analysis, code generation and life cycle tools. Maintenance programmers complain that, so far CASE vendors such as TI and IBM have focused almost entirely on upper CASE tools for new application development. Upper CASE features include planning and analysis tools that help developers draw a picture of how an application should be structured. Lower CASE products are actually used to create the code at the heart of an application.

Reverse Engineering Engines

Although some vendors such as Burlington, Mass.-based Bachman Information System, Inc. are marketing products for data reengineering, no one has solved the problem of reverse engineering existing applications. "So far, the whole CASE emphasis has been in the wrong place," says the Federal Home Loan Bank's Morden. "Maintenance is 80% of what we do, but the vendors have insisted on addressing only 20% of the problem—the development side."

IBM's recent AD/Cycle CASE announcement, for example, included only two maintenance-oriented tools—a test coverage analyzer and an interactive test tool—in addition to the Bachman data reengineering tool set. Analysts such as Gartner Group have called the offering woefully inadequate. IBM officials even acknowledge that, so far, AD/Cycle has only scratched the surface of the maintenance problem. "It's a starting point," says Denis Clark, IBM director of application enabling software marketing. "What we're delivering today is a starter set of some of the things we feel we can deliver. . . . It's not perfect at this stage."

One reason why CASE vendors apparently lack interest in maintenance is, again, the area's history as a second-class function. "Traditionally, most users have set aside practically no budget to buy maintenance tools," says Vaughn Merlyn, president of CASE Research Inc., a consulting firm in Bellevue, Wash. "That may be changing, but many CASE vendors see maintenance-tool vendors struggling to survive, and that reduces their motivation to invest in the maintenance side."

IBM's Clark concurs. "They [customers] do tell us they're putting a lot of resources into the maintenance, but at the same time what they're telling us is that they're not making a dent in the application backlog. That has nothing to do with maintenance."

Users, however, say that until CASE can address all of their software problems, including maintenance of existing applications, they're likely to focus on management solutions and existing tools rather than buying into CASE. "Until they [CASE vendors] can do that, it's just another new technology we've got to learn in order to do what we're already doing," says Dennis Hobbs, manager of systems support

at Alberta Government Telephone in Calgary, Alberta, Canada. His is another company attempting to upgrade the status and efficiency of its maintenance operations.

Although vendors admit that CASE hasn't yet offered much in the way of helping to maintain existing applications, they insist they are working hard to come up with tools. High on their list are reverse-engineering products that assist in analyzing existing code to reconstruct original source information and specifications that have long since been lost or forgotten. Once reconstructed, those specifications can be fed into a code generator, which would reproduce the application in new and improved structured form either in COBOL or in the programmer's fourth-generation language of choice. Among vendors who have major efforts under way to develop such tools are Bachman Information Systems, Language Technology Inc. of Salem, Mass., and Transform Logic Inc. of Phoenix.

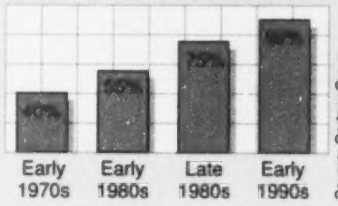
Although reverse engineering sounds easy, it represents a major technical challenge. Experts are evenly divided over whether that sort of reverse engineering is possible and just how automated it could be. Language Technology chairman Eric Bush has said it's only a matter of time before someone perfects automated reverse engineering of existing COBOL programs. But Bachman Information Systems founder Charles Bachman says there will always be some degree of programmer involvement. He predicts that usable reverse engineering tools are five years away.

CASE Research's Merlyn, meanwhile, will have to see reverse engineering to believe it at all. "I have wanted to believe in it, but I just don't," he says.

The Meteoric Rise of Maintenance

Unless maintenance is managed, it could consume nearly all of a users' software resources.

PORTION DEDICATED TO MAINTENANCE



Source: Gartner Group

Even if automated reverse engineering proves to be an idea whose time has not yet come, some vendors are having success bringing existing maintenance tools into the CASE world. Viasoft Inc. of Phoenix, for one, is marketing its own repository supporting a powerful parser and set of maintenance and analysis tools to automate a large portion of the maintenance and enhancement job. According to Viasoft president and CEO Kent Petzold, several CASE vendors are vying to incorporate Viasoft's repository and toolset into their environments.

Until more vendors take such steps to deal with growing user concerns with software maintenance, the CASE market may not take off. "Users are realizing they've got to find some way to deal with the mess created by existing applications," says Geoffrey Barnes, a director for the consulting arm of Cap Gemini America in New York City. "CASE is one potential way to do that, but users are saying to the vendors, 'You've got to prove that it works for maintenance first.' Right now, the answers aren't there yet."

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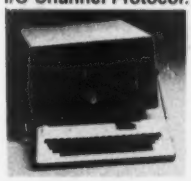

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One Sure Way To Boost Your IS Paycheck: Jump

Should you leave the safe haven of a small pond for the adventure of the big information systems ocean? The rewards may be worth the risk.

BY MADELINE FRANCHI

Information systems professionals at companies with 1988 gross sales of $3 billion or more earn a higher average base salary than do their counterparts at user organizations with sales under $1 million, according to the 1989 DATAMATION IS Salary Survey. Salient findings of the survey, which was based on replies from 344 IS executives, were revealed in our October 1, 1989, issue. Nitty-gritty details from the survey appear here and will be further scrutinized throughout the year.

The difference in average salaries at the big companies relative to the little companies range from 10% more for a consultant to almost 200% more for a director of IS. For 35 job categories in the study, the average IS employee in the larger setting grosses 71% more pay than the worker in smaller organizations.

For the most part, the largest salary differential exists for corporate staff, whereas professionals in data entry and word processing see the smallest differential between big companies and small. As a group, for example, vice presidents of IS, directors and technical services managers at large companies maintain average base salaries 2.6 times the salaries of their colleagues at small firms. By comparison, the average salaries for data entry and word-processing supervisors and operators in large firms are only 1.4 times higher than those of their compatriots in small ones.

Professional Development

Not only do large companies write bigger paychecks but they appear to invest more in their IS employees, too. Nearly twice as many large companies as small companies spend $2,000 or more in training or retraining their IS employees—44.4% of large companies do, but only 23.4% of small companies invest so much. Not that big companies are without their faults—nearly 17% of big firms budget zip for IS training. Still, that's a far better track record than small firms—as many as 37% of such companies have no budget at all for education.

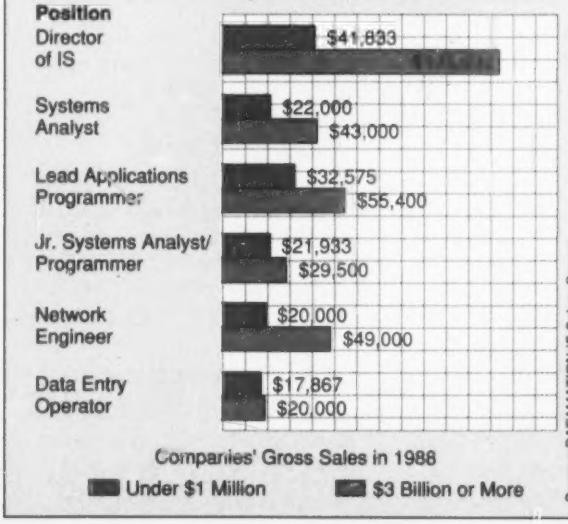
Look before you leap, however. As alluring as the fat paychecks promised by big companies appear to be, subsequent raises aren't so attractive—at least in percentage terms. Last year, notably, most IS executives at big companies expected to raise their staff's salaries by 1 to 5%. Their counterparts at small organizations had bigger rewards in mind—budgeting 6 to 10% pay hikes in a majority of cases. If pay raises go according to expectations, average salaries for some job categories may begin to even out across companies—big and small.

Before jumping into the big time, remember that a number of factors, not just gross sales of an organization, influence pay scales. Geographic location and industry segment also influence pay hikes. Big IS bucks are easier to make on either U.S. coast than in the hinterlands. And the paychecks are fatter in consumer-goods manufacturing, transportation and utility companies than elsewhere. □

More economic information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617)-964-3030.

Where the Bucks Stop and Start

Don't kid yourself. If you're at a small organization, you're probably not making as much money as your peers at big firms.



Where IS Training Is Intense

Not only are you likely to improve your pay at a big company but you may also benefit from more and better training.